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REMOTE STORAGE

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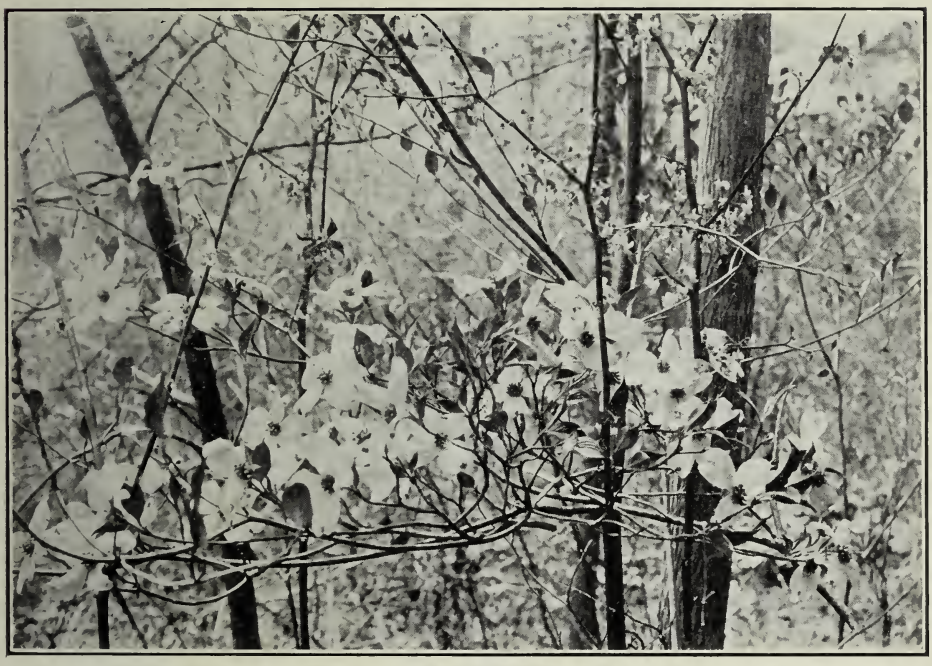
"SPRING IS COMING," SAY THE BUDS.

THE LEAVES SAY "SPRING IS HERE." (THREE WEEKS LATER).

REMOTE STORAGE

A Nature Study of Maryland Plants



DOG-WOOD AND RED-BUD.

FREDERICK H. BLODGETT.

PREFACE.

Nature study is not Science teaching, nor is it popular science. It is the observation and study of nature as it appears in the various forms of life and activity about us, in plants and birds, in animals and in streams. The tiny trickle of water on the hillside may begin to act upon the soil, and the end of that action may be a deep ravine. Between the rill and the ravine there is a period of activity on the part of the stream; watching this activity, seeing the what and how of it, would be nature study (in geology). Similarly watching the life activities of plants is nature study in that field.

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A NATURE STUDY OF MARYLAND PLANTS.

Frederick H. Blodgett.

Buds and Spring.

There are two things that tell us that spring has come; buds and birds; the same two tell of the approach of winter. Between these two seasons many changes have taken place in the plants that started the year in bud and close it again in bud. Some plants do not live through the winter, but have to grow every year from seed, these, of course, cannot have any buds to open in the spring. Others live on for scores of years, growing taller each spring from buds at the tips of the branches.

The unfolding of the buds (Frontispiece), is one of the most wonderful and most interesting events of the plant year. The gradual change of color, noticeable in the appearance of a strip of woodland, the swelling of the buds themselves until they burst and allow the baby leaves and tiny blossoms to get out to the sunlight, and then the rapid growth in size of the little leaves; all this is included in the unfolding. And more, too; because the buds start to grow when there are no leaves on the tree. The leaves prepare the nourishing substances that the tree uses in its growth and existence. These substances, chief of which is starch, are prepared only when the green leaves are on the tree, but the plant usually does not use up in mere growth all the nourishing materials that the leaves prepare. The extra material is stored up by the plants in several ways. Our potatoes, onions, corn and turnips are examples of some of these stored supplies laid aside by the plant for later use. The natural tendency of the plant to store up the extra material has been increased by man for his own benefit, as may be seen by comparing a wild and a highly cultivated form of onion or parsnip.

In the trees and other woody plants the extra food material is not ordinarily stored in the same way as in softer plants, yet it is

stored where it is convenient for use when needed. Take several kinds of buds with six inches or more of the twig, and split them open lengthwise. Soak them in alcohol and water (equal parts) over night, and next morning drop some tincture of iodine on the cut surface. After five minutes rinse in water and see where there is any bluish or blackish stain. This will tell the place where starch is deposited. The deposit nearest the tip will be called upon especially to build the new parts when the bud is changing into leaves or blossoms. Test all sorts of plants for starch, shavings of different woods, and leaves, too.

Seedlings.

While the buds are growing we can get ready for the other kind of start that plants make in the spring—growing from the seed. A number of pots or boxes in which various common seeds are planted will supply a large amount of material for nature work in seedlings, which are full of individualities and differences almost unsuspected. A wide range can be given to this work by which much information may be gained and interest maintained. Take for example the seeds of Pumpkin, or Cucumber, and place them in different positions in the soil of the boxes, some flat, others on end, and on edge, cover with a half inch of soil. When the plants come up see what happens. Which seeds grow best? How does the seed naturally fall?

In contrast to the seed just mentioned try peas and beans, including the Castor "bean," see how they differ from each other and from the first. Notice in the case of the castor seed the great difference in the seed-leaf when it is in the seed, and afterward, when acting as a real leaf. Do the seed-leaves and the true leaves have the same shape?

Exercises upon such a topic will furnish material for a number of different nature periods, and will give some actual information as to the way nature works.

Botany and Nature Study.

The questions and subjects just outlined will serve to indicate the view point of nature study, but even in the writing of the suggestions the work becomes formal and loses its informal nature-study character, and gets dangerously near "Botany." The two merge together in the study of plants, and it is the skill of the teacher that keeps a par-

FIGURE 1—"DANDY-BLOSSOMS"—NO WHITEHEADS YET.

FIGURE 2—A DANDELION FAMILY—ALL AGES.

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ticular piece of information or observation in the form of a nature-study exercise, hence attractive and interesting to the pupil. The teacher should by questioning the pupil, develop the points to be noticed, and obtain their explanation of the why of any change or condition seen; adding a hint here and there when the children need it. They will be likely to give the active teacher a constant supply of things to be looking up for later explanation.

In giving explanations, have them truthful, but not technical, and don't be afraid to say that you do not know, if some point comes up that you can not answer. There are still many points beyond which our knowledge does not yet extend, now and then some one finds one of these points. The plant is a living thing, but it is not an animal, and its activities are distinct from those of animal life, although both are subject to the same laws of physical and chemical processes. It is the mode of life, the way a thing is done that we want to watch in nature-study—it is the observable part of the plant or animal and its life that the pupil is interested in, and which forms the basis of nature work. The informal rambles and excursions which the pupil and teacher take into the fields, or within the school-room, distinguish "nature-study" from the more formal work in any one of the related sciences.

Spring Blossoms.

One of the first flowers to appear is the Swamp or Skunk Cabbage, which may be found in marshy places as early as the middle of February, even when the ice lingers on the water close to the plant. It appears as a compact roll of leaves of a peculiar shade of bright green. The roll soon expands into the separate broad, thin leaves, each of the general form of a flat cabbage leaf. These may be found by the middle of March quite abundantly in wet, swampy places. The second one of the names is due to a peculiarity of the bruised leaves. The flower is not so easily located as the leaves, but by looking by the side of the roll of leaves a pointed hood will be discovered. This is the outer covering of the flower cluster, just as the white part of the Calla is the covering for the tiny flowers of that plant. The shape of the flower as a whole, is after the plan of the Jack-in-the-Pulpit, but the pulpit is a little different in form, and Jack himself is much more

plump and fat. The dark red or red-brown of the flower attracts insects, and by their moving about inside the hood seeds are ensured, because the pollen is properly distributed. The insects find the hoods warmer than the outside air, and find also some nectar to sip, while helping themselves to these benefits they help the plant to form seeds, and so in a sense pay for their board and lodging. The little bodies scattered over the surface of the globular center (the spadix) of the flower are the individual blossoms of the cluster, the whole cluster with its hood (the spathe) being called a "flower" in ordinary conversation. See if there is more than one kind of these little blossoms in the same spathe.

Catkins and Pussy Willow.

The Swamp Alder is among the earliest of the shrubs, and is to be found in localities similar to those of the Swamp Cabbage, and follows it quite promptly in the procession of spring flowers. They are among the most interesting things to bring into the school-room in the early spring. There they will develop their catkins in a glass of water, producing slender brown tassels from which clouds of yellow pollen shake whenever a gust of wind or a pupil jars the twig. This cloud of pollen reaches the tips of the twigs of the same or different plant, and finds there a smaller catkin where it will lodge and then seeds will begin to develop. These seed catkins do not droop like a tassel, but stand firm, like a slim bud, at the tip of the twigs; see if you can find both kinds. There are usually some of the last year's seed catkins left, notice them and see how they differ from the same kind of this year.

The "Pussy Willow" has flowers on the same plan, but differing in the details. The willow catkin has a fringe of hairs or down on each scale that goes to make the tassel, and so looks soft and fuzzy. This down hides the form of the parts, but they may be found by looking for them. The Oak, Hickory, Birch and Chestnut all have their flowers on the same general plan of structure as the Alder and Willow, but each has changed the plan to suit its own nature. Find both kinds of flowers in as many of these trees as possible, there will be some surprises for some of the school.

The Pines and other "evergreens" that have cones for fruits, do not belong to the same group as these trees just described, but their

FIGURE 3—SPRING BEAUTIES AND THEIR FRIENDS IN MEADOW GRASS.

FIGURE 4—GLAD TO SEE THE SUN. ERYTHRONIUMS IN BLOOM.

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flowers have the same form to the glance—both are catkins. But in the cone trees the seed is formed on the surface of the scales that make the seed-catkin or cone, while the Alder has a little jacket for the baby plant in the seed, but the jacket is too delicate for rough handling, and so it is not likely that any of the scholars can see it. But they may be able to see the little baby seeds snuggled close down to the base of the scale of the green Pine cone looking like two tiny bits of greenish pearls, with two little horns or spines at the top of each.

Rapid Growth of Small Plants.

After the Swamp Cabbage and the Alder are out, other hardy plants follow in response to the warm sunshine. The Shepherd's Purse is one of these, and is to be found in the neglected corners of many a last year's garden patch. There are two things about the shepherds purse that will interest the pupil, the arrangement of the leaves, and the way that the flower stalk lengthens. Where are the first blossoms produced? Where are the last, above or below or at one side from the first ones? How much does the stalk grow between the two times? A plant that is even more striking in its growth is the Rock Saxifrage, which starts to blossom when the flowers are right in the center of the leaves, and keeps blossoming and growing until the stalk is six or eight inches high, or more. Get specimens of both of these and grow them in small boxes in the windows where the differences may be watched, and the life of the plant learned at first hand. After the plants are through blooming, do not throw them away, but instead set them out in the school-yard, in one corner where they will not be disturbed, and you will have the beginning of a school garden for nature study of our wild plants. This saves digging up so many plants every year, and gives the teacher a supply of material convenient for use if the weather is bad for long trips. The same work can be done with great interest with the common weeds, get acquainted with them in their winter dress, and watch the change from that to the summer styles. By getting to know the weeds in their winter forms the pupils may find out which are likely to be the worst, and why the worst ones are so hard to get rid of in the field.

Two Hardy Fellows.

Among other early plants, in fact two that may be found almost the year around in warm spots, are the Chickweed and the Dandelion. The Chickweed occurs in several forms, but all may be recognized by the abundant growth of the plant as a whole, and by the flowers. These have five white petals, that appear like ten, because of a deep cleft that cuts into them at the tip. The Dandelion, everyone knows by sight, but how many really are acquainted with it as a plant? How much do the plants that grow in grass look like those that grow on a bare bit of ground? How long does it take for the seeds to become blossoming plants? How long does the stalk grow before the "seeds" are blown away? When does it make that growth, and what other changes go on at the same time? In answering these questions by observing the living plant, some hints will be gained as to the possible activity of even our common weeds that are full of instructive interest. (See plate 2).

When the plants begin to grow in the sunny spots near the school and in vacant lots and in the fields, one can find little patches of seedlings here and there in numbers of a hundred or more. Watch one or more of these spots, and notice how one after another of the plants drop behind until only a few, perhaps not more than a dozen, will be left to grow up. Try the same thing in a box, using lettuce and radish seed, and in half of the box thin out the plants as they grow, so as to give room as it is needed, while in the other half leave all the plants as they come. What differences do you see between the two halves of the box? Why do plants that are well cultivated do better than the same kind that are neglected? A reason for the difference in the cultivated plants, in addition to that of crowding, is found in the better use of soil moisture by them than is possible when weeds and crowding plants take away part of that needed to grow the desired plants. See how much difference there is between two patches of plants in respect to wilting on hot days, when one is well cultivated, and the other full of weeds. This is best seen in the summer and fall. Why?

What Plants Grow in the School Yard?

In the country schools the teacher can give the older pupils in clubs of four or five, plots of ground three or five feet square to watch

FIGURE 5—A HAPPY FAMILY—BLUETS, VIOLETS, FIVE-FINGERS AND PASTURE GRASSES.

FIGURE 6—A WOODLAND PICNIC—WHITE ERYTHRONIUM, LEAVES OF WHITE HEARTS AND MANY SEEDLINGS.

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from early spring until the close of school in June, and then from the opening day until Jack-Frost has claimed the last hardy plant near Thanksgiving Day. Let the club in charge of each plot report through its different members the things that are noticed, once a week, or whenever something is seen of interest, each in turn trying to see more than the previous reporter. These reports could be written as the week's composition, and the best one from each club kept perhaps for some public exercise. In these reports or exercises it will be necessary to name the things seen from time to time. Just name the plant or insect with no more formality than if "John Smith" became a new scholar on some day at school. Just give the name, and let the pupil get acquainted with the plant, as he will with "John," and in the same way, by being with it.

The clubs will learn to know many of the weeds more thoroughly in their plots than in the big fields, and may find some things true of weeds that they never suspected. A weed is only some plant that is growing where some other plant is desired; the finest garden flower is a weed if it is in the wheat or potato field, while they are weeds in the flower bed. Many of our worst weeds have a rosette of leaves on the ground, like the Dandelion and Shepherd's Purse, others have seeds that are similar to those of the crop in which they commonly are found. See if there are any reasons why these two peculiarities of some bad weeds are not present in all. What sometimes takes the place of one or the other of the two? (Running rootstocks, winged seeds; find others). Learn why or how the rosette cluster of leaves is of advantage to the plant that has it, over one that has the leaves scattered. How about the crowding by other plants?

Trees in Bloom.

The Red and Sugar Maples and the Elms bloom in the days following soon after the Alder and the Shepherd's Purse. The growth of the wings of the developing fruits, often called "seeds," in the case of both of these trees is very rapid, and the change in appearance is so marked that a child can hardly fail to be interested in watching the development. Examine the twigs at intervals of three or four days, and notice what part does the most growing. Of what use is the thin part? Test this with the ripe fruits.

While these trees, like the catkin trees, have their pollen carried by the wind, their flowers are more easily examined and the stamens, pistil, calyx and corolla made out quite readily. In the red maple the fruits are conspicuously colored, red at first, becoming green, finally turning more or less straw color as they become ripe. In the Elm the fruit is green up to almost the time that it falls ripe from the tree, and is much less showy than is the Maple, especially as the leaves appear while the fruits are still conspicuous on the twigs.

Meadow Blossoms.

By the time that Elms and Maples are past, there will be a number of low-growing plants in the mellow soil near the brooks, and in warm ravines ready for the bees and other insects. Among these are the Spring Beauty, Erythronium and Bluets, and later, Jack-in-the-Pulpit.

The Spring Beauty has a delicate pink blossom, pencilled with darker pink along the veins of the petals, and has narrow fleshy leaves. The "root" is nearly round like a marble, with the leaves and blossoms growing from the upper surface. From the under surface the feeding roots are produced, the whole being about two inches below the surface of the soil. The way these look as they come up in the meadow can be seen in figure 3. It may be of interest to the teacher of Maryland to know that this plant bears the name (Claytonia) of one of the early travelers in the Chesapeake region of Maryland and Virginia—John Clayton. He collected and sent specimens of plants to England, where they formed the basis of Gronovius' Flora Virginica, published in 1743. He also sent specimens of the Erythronium or Dogs-tooth Violet to England, but these had already been known for a hundred years, bulbs having been sent thither in 1635.

The Erythronium is the first flower of the lily type or form that the spring gives us, being in its prime in the first half of April. The two spotted leaves, and the single nodding yellow flower, in shape like a tiger lily cannot be mistaken. A colony in the open ground, in full sunlight is shown in photograph 4, in which the recurved petals are clearly to be seen. Honey bees, bee-flies and other insects visit the flowers and aid the plant to set seed as they move about after the nectar or pollen. Let some of the boys dig for the bulbs, and determine, by collecting these at intervals of a week, how the flowering bulb

FIGURE 7—MAY APPLES SPREADING THEIR UMBRELLAS FOR APRIL SHOWERS.

FIGURE 8—WILD PANSIES AMONG THE OAK LEAVES.

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gets so deep in the soil when the little plants are almost on the surface. Do the blossoms open the same on dull and on bright days? When are the seeds ripe?

By the Roadside.

About the same time that the Claytonia is in good flower there will appear along the roadsides and in pastures the pretty little blue flower known as "Bluets" or "Quaker Ladies," figure 5. The flower has four blue petals united into a tube around the stamens and pistil. The leaves are in a rosette, flat on the ground. These little plants are splendid subjects for window-box study, and when they are through flowering can be set out in the school-yard, in the wild corner. Compare this plant with the Shepherd's Purse in respect to the order in which the flowers appear. Where is the last blossom in each of the two plants?

In the woods the Arbutus or Mayflower is now due. It is hardly necessary to speak of this delicate friend of the spring days, all are so fond of its delicate pink tints and fragrant perfume. It is a very slow grower, and should not be dug up, but studied in its home, there it can be watched, and it will not wither and die as it does when taken away from its home friends. Set a mark of some kind close to one or two of the plants, and see whether they have the same tint of blossom two years in succession. Find out what insects visit the flowers, and what other flowers are visited on the same trip.

There are increasing numbers of flowers from now on, any one of which would afford hints for study, and furnish material for nature work. The early summer is hinting of its approach by occasional hot days, and we must get along before the Spring flowers are all gone.

On the Rocks.

The little white Saxifrage is in its prime in mid-April, and is worth a study. It starts with a few white blossoms tucked away in the center of a rosette of leaves, perhaps two inches across. Dig up one or two of these, and bring them in for the whole school to watch. It is just fun to watch the stem get longer and longer as the flowers increase in numbers and in age, so that the stem that started in the center of the rosette with two or three flowers will finish its flowering with a length of eight or ten inches. The growth is so rapid as to be

easily watched by planting a slender stick by the plant, and measuring the stalk once every other day (use a rule divided into 1-16 of inches). When is the growth most rapid?

In similar but more shaded situations, in the rock dust and fallen leaves, the "White Hearts" or "Dutchman's Breeches" are to be found at the same time that the Saxifrage is in flower. The flowers of the plant are shaped like the "Breeches" of some little Dutch fairy, or perhaps it is a "Brownie," but I like the other name the best—White Hearts. Another name which suggests the life of the woods is "Squirril Corn" from the appearance of the root, looking as if there were a cluster of kernels of pop corn stored away for some family of hungry squirrils. The leaves of this plant are delicately cut into slender fingers along the edge, and would afford patterns for drawing for a week or two, and still give fresh points for further exercises, especially when used in connection with the sprays of white blossoms. The leaves show at the left-hand edge of figure 6.

In Mid-April.

By the middle of April the flowers will be fairly abundant, the buds on the trees will show their little leaves that so soon grow up, and then become scattered along the home twig as it develops its length. In the low ground especially will plants be found in abundance now, and plants that do not bloom until June or July will begin their more leisurely growth. Among the plants that develop less rapidly than those already mentioned is the May Apple. This is now sending its closed umbrellas through the soil in the low ground, as may be seen in the photograph in figure 7. Watch the umbrellas as they unfold, and observe the difference between the plants that bloom and those that do not have a flower. In how many other plants in the spring is there a difference between the flowering and non-flowering individuals, beside the blossom which is present in some and not in others? See if you can tell from the appearance of a plant whether it will blossom this year or not, when the flower bud is not visible even if it is there.

The Blood-root is a white star in the open woods, among the leaves of last year's oak and hickory trees. How is the flower bud protected? How did the plant get its name? See if there are any

FIGURE 9—AMONG THE ROCKS.

FIGURE 10—"INDIAN PIPES" THAT NO ONE SMOKES.

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other plants that have the same peculiarity. If you find any see how many other points the plants have in common, especially in regard to the flower and its parts.

Violets should be found easily now, and will give some of the pupils a pleasant task in discovering how many kinds can be found near the school. Look for the Pansy Violet in the edge of pine woods, and mark some of the plants to see whether they always are the same. There are two forms, one with the petals purple and light blue, the other with the light blue petals only. A cluster of the wild Pansies is shown in figure 8. One of the other kinds of Violet is seen in the same photograph with the Bluets in figure 5.

Among the plants that have nearly done blooming by this time, and which have not been mentioned already, is the purple Hepatica, with its three-lobed leaves and the Mertensia or "Blue-bells." This is shown in photograph 9, just to the right of the tree near the center of the picture. On the other side of the tree is a Jack-in-the-Pulpit, and some leaves of the May Apple, with the umbrellas spread wide, are just beyond, near the edge of the picture.

The trees, Maple and Elms, Oaks and Hickories, are nearly or quite through blooming, and are pushing the leaves and fruits toward full growth. The Apple and Peach, and Pear and Plum, are scattering their pink or snowy petals to the breezes, supplying the bees with their food and drink, the fruit trees receiving in return a more certain set of fruits.

This is a good time to compare the appearance of the trees as they were in the winter without leaves, and now in the late spring with the leaves almost hiding the branches from sight.

May Blossoms.

In the later spring we find the petals of the fruit trees and bushes scattered to the winds after a few days work on the part of the bees. The Chestnut is lagging behind its relatives, the Oaks, and will wait until its leaves are fully grown before the blossoms will appear that will give the nuts for next winter's fireside. More conspicuous than the single flowers of the other trees are the blossoms of the Tulip Tree or Poplar. These are like an orange-and-slate tulip blossom, compact cone of pistils at the center of the flower slowly ripen, and

pistils in a compact cone at the center of the flower slowly ripen, and of which it was finally separated. The winds of the fall break up the cone and scatter the individual fruits of which it was formed.

With the coming of May the roadside weeds become more abundant, and over everything the new growth of vine and climbing plant extends, as if to hide the fences and old brush piles. Wild Honeysuckle is at the front in this work of hiding things, and adds the two-lipped flower for the slender tongues of the honey lovers. See what these are. Later the Trumpet-vine will show to the humming bird its orange colored tube, and the bumble bee will try to get the nectar too. See whether he succeeds, and if you can see whether he does as much good as does the little humming bird. (Examine the flower. Which is likely to get pollen from the stamens upon the pistil best).

Lazy Plants.

Often in the clover fields there will be seen patches of yellow threads, that break easily, and have compact clusters of small white blossoms scattered along their length. This is the Dodder, a plant that lets the clover do the work of preparing the food that it needs for its own use, and then steals part of it. The Dodder is a parasite and since it has neither roots nor leaves, it cannot do any food preparing for itself, so it finds some plant that it can grow upon, and steals what it needs from the more valuable member of the plant community. All the Dodder does is to feed upon the Clover and blossom so as to set seed for the next year's crop of Dodder. Get some of the seed and see how near they resemble those of Clover in size and weight.

The Indian Pipe grows in oak woods in the summer months, and looks as is shown in the photograph (10). It, too, is a lazy plant, using the food that other plants have prepared instead of doing the work for itself. But in this case it does not use any of the food until the other plant is through with it, then it gets what is left in the fallen leaves. In order to do this it goes into partnership with some fungous plant, which helps it to get the nourishment from the decaying leaves, and in so doing help the leaves along their path of decay. The Dodder does no good that we can see, but the Indian Pipe is of service in assisting the formation of the rich wood soil, through the breaking down of the remains of leaves and twigs.

The Mistletoe is another lazy plant; but as it has leaves of its own it does some of the work of food preparation for its own self. Even by doing part of the work itself it often kills trees when it gets abundant upon their branches, as in the Southwest.

The Evening Primrose is due for blossoms from now on, and will be a good plant to watch. The night flying moths visit this flower to do the work that bees do for so many plants, in return for the nectar they receive. On what part of the stem do the new blossoms come? How long does one flower last? Do they last any longer in dull, cloudy weather than on bright sunny days? When the seeds are ripe see how they get out from the seedpods. Evening Primrose is of special interest as being a plant that has developed, in the past few years, of its own accord, a new form as distinct as two wild ones that would be called different species. This occurred among plants grown in a garden from the seed of one original plant, and the new form has grown from its seed as true to name as did the old plant before the new one appeared.

Some Friends of Late Spring.

The middle of May finds the later spring flowers hurrying to get their blossoms out before too great heat, or too dense shade comes to interfere with their healthful growth and development. The Fringe Tree with its large leaves and clusters of white flowers hanging like tassels at the tips of the branches, is due now, with Tradescantia, Blue Flag, Lady's Slipper, Azalea and the early representatives of the Sunflower family. The Fringe-tree is shown in the photograph (11), with the leaves showing above each cluster of white tassels. The first of the Sunflower family is usually found in shaded woods, and is often tall and slender, with golden-yellow flowers, each on a distinct stem. This is Senecio (or Golden Rag-wort). If there is only one flower, or one large and a few slightly smaller flowers, at the top of a hairy stem, the flowers like a Daisy, only lavendar or bluish instead of white, the name to be given would be "Robins Plantain." Or if there was a flat cluster of leaves, a rosette, on the ground, the leaves bristly, and the veins colored reddish, it would probably be Golden Hawkweed, especially if there are several golden-yellow blossoms at the top of the slender stalk. The flowers do not have a center like the Daisy, but

are like the blue Chicory that will come later, only ray or strap-shaped flowers are found in the flower-head. (The Daisy has white rays and yellow disc flowers, each one of them being a single flower, the whole "blossom" being properly called a flower head). After these forerunners the relatives come along rapidly, Daisies, Sunflowers, Wild Lettuce, Bone-set or Thoroughwort, Thistles, and the many forms of Golden Rod and Aster. With these and other forms the family of the Sunflowers will keep the fields occupied with their brilliant or delicate colors until the last Aster is killed by frost, or some hungry animal feeds upon a lingering Golden Rod.

June Is Here.

The last week of school find the wild Rose, Laurel, wild Peas of several kinds, and Grasses all in bloom. The Rose and Laurel are two that it will pay to watch for a while some morning. The bees visit the blossoms of each, but do not act the same in both cases. Find a clump of Roses that are freshly opened, and see what a bee does as it gets the nectar that is to be found by him at the base of the petals. When he has finished with two or three flowers see what he will do next. Having seen the bees at work in the Rose, watch them in the Laurel flowers, and observe to how great an extent they work the same in the two cases, and why there are any differences in their way of working. The milk-weeds are coming into bloom in early June; one of the earliest being the conspicuous "Butterfly Weed," the deep orange flowered weed of pastures and meadows. Another kind that likes the dryer land has small white flowers each on a distinct stalk, the whole plant being much looser in its appearance than the other, and the pods are much more slender.

The wild Raspberries, Strawberries and Blackberries are getting their fruits ready in size and color for the boys to pick and the birds to eat, and in the woods the Huckleberries are getting ripe enough for the pies and shortcake that taste so good at haying time. In the lower ground the May Apple should be turning yellow and soon be ready for those who like them to eat, while looking for that old spring from which to get a cool drink.

FIGURE 11—NATURE'S FRINGES IN LOOSE TASSELS.

FIGURE 12—YOUTH AND OLD AGE, A FALLEN CHESTNUT SHOWING YOUNG AND OLD BARK.

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Summer's Contrast with Spring.

Before school closes for the summer, take the class to several of the plots suggested in the earlier part of this bulletin, and call attention to the difference in the appearance of the plots now, and as they were when first measured in the early spring. Many of the plants that were then prominent, have given place to later ones and left hardly a sign behind them to show that they had been there. Of this character is the Erythronium, which wilts down so completely as the seeds are ripening, that by the time they are ripe it is hard to find the plants, and in a few weeks more, practically no trace remains above ground. Other plants come in to occupy the ground these earlier forms used, and some of these will in turn give way to still later kinds; but the change is not so noticeable as with the first flowers. Examine if possible one of the little beds of seedlings, where the plants were so thick at first. How many are there now out of the many that were then seen? Compare this observation on the wild seed bed, with the exercise in the class-room on seedlings, using the Radish and Lettuce seed. Does the seed box help to explain why there are not so many plants now as there were when the plants were first observed?

Compare, too, the trees, that now are covered with leaves, so as to hide almost completely the skeleton that supports them, with the same trees as they were in the spring, bare and dark. Turn to the first two photographs and see the difference the leaves make in the landscape. Take a twig, and by laying it upon a desk, see how completely its leaves cover the surface; then remove the leaves and see how little of the surface is hidden. This and similar simple exercises will show how much greater is the surface of the plant which is exposed to the sunlight of summer, than is that exposed to the storms of winter (in broad leaved plants). Turn back to buds* and see if there is any relation between the arrangement of the leaves and the work of those same leaves, (leaves make starch in sunlight, and by keeping out of each other's shadow, each leaf has an equal chance to make its share). From the above suggestions the teacher can select or add such as will give a good basis for a closing exercise on the last day of school. This could be so managed as to show to the parents how much there is to be seen about

*Page 1.

the school and farm, and indicate their children's growth in expression and power of observation. Compare the bark on young and old parts of a tree, as figure 12.

Vacation Days.

Now because school has closed and the teacher has gone home, do not let the pupils think that there is nothing more to learn until the door is unlocked again, and the teacher rings the bell. Ask the scholars to keep their eyes open, and to tell you, teacher, what they may have seen during the summer, and on your part do not fail to ask for their accounts when the time comes and school is open.

The Thistle is one of the plants of vacation time. How many kinds grow near the school? What insects commonly visit thistle flowers, and do any birds eat the seeds before they are quite ripe enough to be blown about by the wind? Another weed of pastures is the Mullen or Velvet Leaf. This has several velvety leaves on the ground, from which there arises a leafy stalk with yellow flowers. The stalk lasts almost all winter. See if there is any reason for this long endurance of the dry flower stalk. There is a nearly smooth form that has yellowish or pale pink flowers, and usually has a number of globular seed capsules below the flowers on a more slender stalk than the previous form.

The stamens of the slender Mullen and of some other plants are fringed with hairs that add greatly to the beauty of the flower, when seen close by.

In corners of orchards, and sometimes in fields, there is a plant that is delicate enough in its appearance to be a garden flower, if it did not have the bad habit of staying when it is not wanted, and going where other plants are desired. This is the "Lace Flower," but it is more often called "Wild Carrot," and is shown in its natural growth in photograph 13. This plant is also called "Birds-nest"—see if you can discover why. The "Butter-and-Eggs" blossoms along the roads in the vacation season, and is a well-known weed, but not a serious one. There are various wild Clovers, Vetches, and their relatives in the fields and woods; the Sweet Clover, yellow and white, tries to hide the bareness of the vacant city lot, or the neglected corner of the commons. Through the lighter soils of the state the Rabbit or Woolly

FIGURE 13—WILD "LACE FLOWERS," SOME CALL IT WILD CARROT.

FIGURE 14—THE COILED-UP YOUNG LEAVES OF FERNS.

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Head Clover is found often to the embarrassment of the strawberry grower. All these Clover plants have tubercles on their roots as in the case of cultivated forms; pull some up and see the little knobs on the roots. Are these more abundant in the wild or cultivated forms on the same kind of soil?

July Plants.

In July the Swamp-mallow will be blooming along the edges of the tide marshes, along with various other marsh lovers. If convenient to get some of these in flower see what resemblance there is between them and the Hollyhock, and the shrubby Hibiscus in the flower. The little "Cheese-mallow" is also a relative of the rest. Along the edges of the woods, especially in damp shaded places, there may be found a plant called "Jewel-weed," related to the Balsam of the garden. See if the pupils can learn why the plants gets its name—jewel. As a suggestion try holding a leaf under water under side up. Is it wet? Why not? How are the seeds scattered in this plant? This gives another of its names—Touch-me-not.

During July the ferns that came first as woolly coiled "crosiers" (see figure 14) will be fully grown, and offer much in the way of beauty in the cooler woods (figure 15). Sometimes a couple of dozen kinds can be found in the vicinity of the school, and a few leaves pressed between newspapers can be used during the winter in the indoor nature-study. Before the frosts come one or two clumps of the most common fern in your neighborhood might be dug up and left in the wood-house for a few weeks, covered with old sacks. Toward Thanksgiving Day put the plants in a box of earth big enough for the roots to be not crowded and watch the development of the fern fronds indoors.

In August and September the Goldenrods and Asters will be the prominent flowers of the fields and woods. The Cardinal Flower will be found along the little streams that run through the pasture, and the Closed Gentian is likely to be near by. How does the bee get the nectar from the flower of the Closed Gentian?

School Again.

With the reassembling of the pupils in September one of the things likely to be noticed, if only a hint is given, is the difference in

the plant life that has come during the vacation. In June the plants were fresh and bright in their new suits of green, the new wood was soft and watery, and still growing, and the fruits still green in many cases. But in September the leaves are dirty with the dust of the summer and ragged with the work of the summer's insects. The fruits have ripened, and the wood of the twigs has become harder and less watery so as to be ready for the winter. And buds, that we noticed the first of the year, are well developed for the next season.

Among the plants commonly called "weeds," are some worth noticing in addition to those already mentioned. Along the waysides and paths the Plantains with their ribbed leaves, hence called "Rib Grass," are found mainly in two forms, narrow and broad leaved. Both of these are found in grass, in contrast to the downy forms that occur on more nearly bare soil. The seed is about the size of clover seed, and is likely to be distributed on account of that feature. How?

The fences and neglected corners generally are likely to have the Burdock and Yarrow, with the several plants called "Pig-weeds." These are coarse plants, all of them, and have little if any value in this region. Relatives of the Pig-weed are used where other food is scarce for fodder. In vacant city lots, and similar localities, the two forms of wild lettuce are to be seen. One of these is practically a compass plant, tilting its leaves edgewise so the upper and under faces are exposed to the light equally, and their stalks twisted so that they all are located on the north and south sides of the stem. Try transplanting some of these, and see if the plant will correct any variation as it is replanted.

Watch the tangles of vines over the shrubbery and fences at the sides of the road, for the tufts of plumes of the Virgin's Bower, and for the red fruits of the Bitter-sweet. These last appear to have two colors to the fruit, as the outer portion curls back exposing the bright scarlet pulp, against the lighter red of the husk. A second redberried fruit is that of the Strawberry Bush; these are three-lobed in clusters at the ends of slender green twigs. The plant finds its home in the edges of moist woods, and may be recognized earlier in the year by the green bark, flowers resembling those of a "wax plant" often seen in homes. The leaves are opposite each other, making a row on the sides of the twig, in contrast to those alternating along the two sides. As

FIGURE 15—FULL-GROWN FERNS IN A SHADY NOOK.

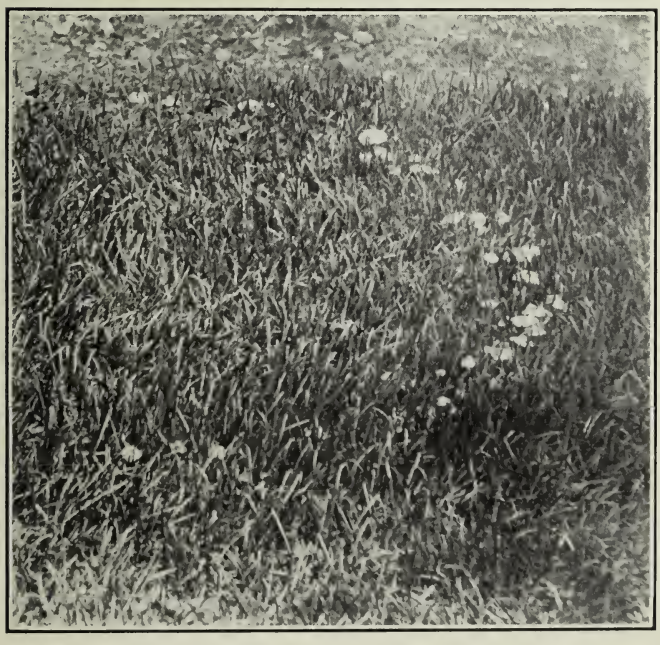

FIGURE 16—WHERE THE FAIRIES DANCE.

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the fall gets nearer the yellow and purple Gerardias will be found close to the Goldenrods and Asters along the edges of the woods or shaded roadsides. Both the Goldenrods and the Asters belong to the same family with the Sunflowers. In the Asters the Sunflower style of flower is easily seen, as the center of the "blossom" is different in color from the rays, but in the Goldenrod this is not so clear as the parts are so much smaller, and all are of the same color. The Daisy and Brown-eyed-Susan belong to the same family.

As the cold weather gets near the coloring of the leaves will be of prime interest to the pupils. What kinds color first, which turn brightest, which have green and red in bright shades on the same leaves most often, which stick to the tree, what kinds turn brown only and which let the flat part of the leaf drop before the leaf stalk drops? All these questions and more can be asked and answered at the season when Jack Frost has his paint pot out on the clear frosty nights.

Let the pupils gather seeds and fruits of the weeds that are so abundant now, and learn to know them; later use the seed so collected for a set of seed boxes, and learn to recognize the seedlings of our worst weeds. How do the seeds of the weeds get scattered? Do the seeds naturally so fall on the ground as to be in the best position for germinating? Watch and see which ones tend to do this way.

As the trees shed their leaves, show the pupils how much less surface there is for the snow and ice to cling to than there would be if the leaves remained on the tree. The trees that keep their leaves through the winter usually have narrow ones as in the various Pines and other cone bearing forms.

Toadstools' Autographs.

In the grass of pastures and lawns there are occasionally seen more or less complete circles of toadstools. These are the Fairy Rings that legend says are the dancing floors of the fairies and other little wood people, perhaps of the Brownies, whose little white breeches we saw early in the spring. The toadstools live upon the decaying grass leaves and similar material, and as they use up the food material, the circle is made larger because the feeding fibers that do the work of roots, grow out into the fresh part of the lawn where the food is not used up. Part of one of these circles is shown in the photograph 16.

Now to get the autographs. Take some of the toadstools that are full grown, but not old, and cut the stem off close to the cap. Put the cap, stem side down, on a piece of paper (try both white and colored), and cover it with a tumbler to keep it free from any current of air. Let it stand over night, and next morning lift the tumbler, and the cap very carefully from the paper. On the surface of the paper there should be a picture of the under side of the cap. This has been formed by the spores of the toadstool sifting down from their tiny stalks all night, each one falling upon the paper adding its little to the whole until the picture is finished. To preserve these use a thin solution of gum arabic in water, and with a soft brush wet the paper through from the *back,* until it is thoroughly damp all over. When it gets dry it can be handled at leisure. Additional kinds of toadstools can be found in the woods and their autographs obtained also. There is too great risk of death in eating any of these forms to allow any of the pupils to try them. Do not eat any toadstool or mushroom found out of doors. There is not food enough in them to make up for the risk, and there is no antidote for the poison known.

Winter Is Almost Here.

After the field plants are dead and the cold nights make one think of Christmas and New Year's, the Witch-hazel blooms, and the ice wings of the frost weeds come on the frosty mornings. The ice wings are usually found near the ground on the stems of Goldenrod, Aster and Gerardia, or other stiff stemmed plants, growing in damp places. The wings—frost flowers, appear as ribbons of delicately banded ice crystals projecting from the stem, often in graceful and complicated curves. They are best on mornings that have a "frost fog" at sunrise and for a time afterward. If they are found, mark the stalks and see how many times the same stalks will have the frost flowers, before the stem is so far gone that no more can be formed.

On the mornings when there is a heavy white frost look at the leaves and other frost covered objects, and see how the frost crystals are ranged on the surface, and along the edges. Notice how differently the frost forms upon the different surfaces, as they happen to be of different substances. Try some experiments, putting different things at various places in the school-yard and see how the frost acts. Why

FIGURE 17—LEAFY WOODS IN MIDSUMMER.

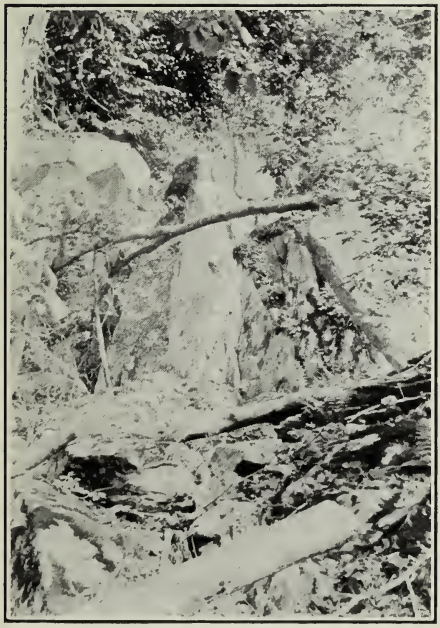

FIGURE 18—A ROCKY NOOK.

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does a paper keep the frost from injuring plants under it? Would a leafy branch act the same way, if close enough? Does frost form on snow?

Conclusion.

These notes are intended to suggest some topics of observation for the Maryland teachers in their nature-study work, but do not attempt to more than indicate some of the many plants, or a few of the many incidents that may be found in the life of almost any plant. The year's activity of our common plants will supply material in abundance for the nature work, and through that for the drawing and written exercises as the pupil tries to express his observations on plants. In the older classes the simpler exercises can be extended to include comparisons between groups and individuals among the plants, and between the corresponding parts of them. Be careful, especially in the higher grades, not to get formal and scientific; be accurate and truthful. It is nature as manifested in plant life that we are to study, and not Botany.

The teacher should keep a note book for personal records of the topics used, and observations made in the class, and hard questions asked. This will help in avoiding the repeated use of the same material, and the duplication of closely similar exercises. Get all the meat from the nut while it is in hand, and then pass on to something else. But refer back occasionally when a comparison or difference is striking between a new and an old exercise.

The study of seedlings, and their response to light is a topic that may revive interest when some other forms of exercise may fail. Try all the different seeds that can be obtained, including such as the castor "bean," nasturtium, the forage plants as cow peas and soy beans, and any others, and much will be discovered a little different from what it was thought to be.

Try to have the work mature along with the pupil, so that the child that in the kindergarden grade, compared in shape and size the early leaves with those of summer (figure 17) will still have so much interest in nature study as to be eager for the plot work or school gardening.

A Baltimore School Garden.

The garden in the school-yard shown in the photograph* is now in its second year. It is a part of the girls playground of school 62, Walbrook avenue and Smallwood street, Baltimore, and has been developed by Miss Elizabeth Montell. Many of the seeds are used first in the school-room in cigar boxes, etc., filled with earth, and the young plants later transplanted to the beds shown.

The soil for these beds was brought in from outside by the boys, and all the work of preparation of the ground and care of the plants and so on, is done by the pupils. Both flower and vegetable plants are raised, especially such as grow quickly, as radish and lettuce.

The photograph shows also the general character of the neighborhood, and of the school-yard.

The pupils regard this work as a treat, and it is, therefore, available as a means of discipline, the privilege or its denial, acting as a reward or punishment as the case may be.

Miss Montell is one of the enthusiastic teachers who is adding nature-study to her class-room work of her own accord. She feels that it pays both from the teacher's and pupil's standpoint, allowing each a bit of relaxation from the more formal and strict work of the programme.

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*Taken by J. H. Schaefer, May, 1905. All other photographs by author.

A BALTIMORE SCHOOL GARDEN.

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